

ReadVerify® Appliance (RVA) 4.0

1. What is RVA?

Crossroads' ReadVerify® Appliance, or RVA, ensures the proactive readability and protection of data written to tape. This is accomplished through advanced media management features such as performance and utilization analysis, tape media and drive statistical data logging, and automated report and alert functionality. RVA validates the readability of data, tape media, and tape drives. It provides historical resource monitoring and reporting enabling proactive management of tape media errors, resulting in increased data integrity and cost savings. The RVA is available as a standalone, compact 1U Linux rack-mount appliance, connected via Fibre Channel with an HTML management and reporting user interface, or as a virtual machine installed in a VMware ESXi 4.1 environment.

2. What is meant by a "stand-alone" appliance solution?

The ReadVerify Appliance is a 1U system connected via Fibre Channel with a browser-based GUI. The appliance connects into the SAN specifically within the domain of an automated tape library. It uses a polling-based, out-of-band operation that does not interfere with the backup operation. Within the appliance are a processor, memory, and a hard disk to store the database, and provide advanced management features and functionality such as tape and drive statistical data logging with automated report and alert functionality. The appliance periodically polls the library and tape drives to obtain tape and drive historical data, which is stored within the database. The database component resides on the hard disk in the appliance, which is used to store the RVA configuration and records retrieved. The HW and SW support the regulatory compliancy of retaining records for the periods required by the latest standards.

3. How does the VMware version differ from the stand-alone appliance?

The VMware version of RVA has all the same features and functionality as the 1U appliance version. It also collects via Fibre Channel and reports on tape system information through an HTML interface. However, instead of installing as a 1U rack-mount appliance, the virtual RVA installs as a virtual machine in a VMware 4.1 ESXi environment.

4. Why would customers need this solution? What are the benefits of RVA?

- **Tape Media Integrity** – Enables proactively media management for suspected degradation, providing a vehicle to remove error-prone or defective media.
- **Utilization and Performance** - RVA measures the utilization of each unique drive in the overall automated tape storage system (application, network, and tape drives within an automated tape library), providing a method to tune the environment to achieve the maximum usage of all available assets. Additionally, the actual performance of each individual drive is measured (not the theoretical performance) which enables the user to determine if their environment is configured properly to maximize the use of the tape assets.
- **Monitoring, Automatic Alerts and Reporting** – Provides secure, instant access to view status of drive utilization, comparison between drives, drive failure, cleaning status, associated tape media, slot configuration, tape degradation and errors. Alert and report configurations are all easily managed from an HTML web-based console. Alerts and reports are generated and stored as a log for reference and sent out automatically via email on a regular, pre-determined schedule (e.g. per day, per month, or on a per event basis).
- **Seamless Heterogeneous Deployment** - Interoperates with any make or model of Fibre Channel tape drive, library or tape storage application. Supports multi-vendor environments.
- **No Performance Degradation of Servers or Clients** – Installs in a Fibre Channel network out-of-band of the application data path.
- **Disaster Recovery** - Many current backup and archive environments accept failure as a part of the process, and deal with recovery failure by making multiple tape copies and/or repeating the process on a regular basis. In this manner the user can minimize their exposure by having enough repetitions such that one of them will be good. This is both costly in media usage and system time. Many users willingly pay for this failure-wrought process by duplicating systems for improved data transfer speed and repeating specific transfers for systems that are classified as critical. The problem is that they user doesn't ever know or is certainly never confident that a data recovery will work until it actually completes successfully. The ReadVerify Appliance gives the user a proactive method of managing their media such that they have a higher sense of confidence in the systems ability to read the data on the media if required – before a disaster occurs and before the data is

- required to bring the data center back on line.
- Satisfy Regulatory and Policy Compliance Mandates – Data retention is only half the mandate: SOX, GLBA, SEC 17a-4 rule require retention AND retrieval of data. The RVA Provides the user with the added assurance of the overall tape system’s capability to read the media.
- Meet the Demands Incurred During Litigation and Discovery Requirements - Companies can face non-frivolous internal and external lawsuits at any given time. Failure to produce data under court orders can result in severe civil or even criminal penalties. (Kaufman v. Kinko’s Inc., Braxton v. Farmers Insurance Group, Tulip Computers International v. Dell Computer Corp.1). Since keeping all data on-line is expensive, the backup process is a common method of removing and archiving data. When the requirement to produce information results in a data recovery operation by the company from tape media, a recovery error is not an acceptable reason for failure to comply with discovery requests. Having the RVA enables the user to proactively manage their media archive and take steps to guarantee that all information is available – before it is required!
- Pre-empt Catastrophic Recovery Costs or Inability to Recover - One of the largest liability risks a company faces today is the inability to recover data. The potential for lost revenue and loss of sensitive data such as financial, personnel records or intellectual property are all immeasurable cost as well as in many cases immeasurable losses. In some cases this even leads to the ultimate closure of the business.
- Avoid Loss of Corporate Reputation and Viability – A company’s ability to recover from a catastrophic data loss is directly correlated with the company’s ability to survive. Customers, shareholders, and even employees expect a business to recover from data loss, in fact in most cases they don’t even want to know that a recovery operation was even required. Therefore, and situation that differs in which a company’s lack of recovery capability becomes known will cause issues with its reputation and ongoing business viability.

5. Which storage applications does RVA work with?

RVA works with any open-systems storage applications on the market. This includes the major backup applications from IBM/Tivoli, Symantec, Commvault, EMC and HP, as well as HSM applications such as HPSS and SAM-FS and archive applications from EMC, Front Porch Digital, and others. The RVA monitors devices independently from the applications and will work with any applications that are designed to share tape resources.

6. Does RVA require backup application-specific software agents to be installed on storage servers?

No. A key advantage of RVA over other reporting tools is that the appliance is completely independent of the application in use and does not require agents for monitoring.

7. RVA is positioned as a complimentary, not a competitive product to a client’s existing backup application. Please explain.

RVA is architected to work with the majority of backup applications available in the market, including products from IBM/Tivoli, Symantec, Commvault, EMC and HP. All of these products have monitoring and reporting capabilities. The monitoring and reporting features of these products are a proficient view into the success or failure of the individual backup jobs.

RVA monitoring and reporting does not focus on the individual backup jobs, rather, it gives visibility to the overall health of the tape environment and components. RVA focuses, reports and alerts on trends within the backup environment.

What does this mean?

What this means is that RVA enables the storage administrator to take a much more holistic, preemptive and proactive approach to ensuring the overall health of the tape library environment. RVA reports daily and weekly and alerts on performance trends of the critical attributes of the tape media and devices. While backup and storage applications tend to focus on the success or failure of the data transfer, RVA does trend analysis, reports and alerts on every device within the library, including the tape media. RVA correlates the tape media to the drive, further enabling the trend analysis functionality. RVA’s ability to proactively alert the administrator on such critical events as media and drive degradation ensures that proper actions can be taken before tape failures occur.

RVA does not rely on combing through the log files of the applications to extract information, which can be tedious and time consuming. RVA does analysis, reporting and alerting based on the data that is captured and stored in the RVA database as a result of this polling. Graphical “at a glance” views present this critical information. This ensures instant access to the all of the information regarding the performance and health of the tape environment, including drive utilization, comparison between drives, drive failure, cleaning status, associated tape media, tape degradation and errors.

So, is it safe to say that RVA delivers to the storage administrator a level of intelligence, assurance, and information around the overall health of the tape environment that is not delivered by the native storage application?

Yes. Again, RVA reporting and alerting compliments the information provided by the application. RVA provides the intelligence to tune the environment to enable the most efficient data transfers and configure the environment to maximize the use of tape assets.

8. What is the expected ROI for using RVA?

- Support for Measurable ROI Including:
 - Performance gains in tape usage – Proactively assess tape media validity and alert on media degradation; correlate errors to specific media or drives for quick, proactive resolution that minimizes recovery failures

- Resource maximization – Maximize utilization of existing resources through load-balancing, identification of under- or over-utilized drives; Eliminate spending on unnecessary drives;
- Support for Immeasurable ROI Including:
 - Tape integrity assurance – Know that data written to media is recoverable WHENEVER it is required

9. How many reports are provided within RVA?

The ReadVerify Appliance (RVA) can automatically generate reports on a daily or weekly basis according to parameters that you define. Reports can also be generated by drive groups, to more closely match storage application configurations.

The following information is provided in daily reports:

- Library details
- Drive graphs and statistics for each drive in the library, including the following:
 - Drive utilization graph, which shows the amount of time each drive in the library was used during read and write processes
 - Drive performance graph, which shows the write performance graphed over the last 24 hour
 - Drive errors, status, firmware version, and data read/written
- Tape usage table, which lists each tape loaded in the drive and the statistics for each load
- Any alerts that occurred in the 24 hour period

Similar information is available in the weekly report, over a period of the previous 7 days.

10. How hard is it to add a report?

Templates are provided to facilitate report creation. The template steps the user through the report definition/creation process which enables the system to automatically generate the report on a daily or weekly basis.

11. I have read literature which describes the RVA as a device linked to tape storage. Does RVA also monitor disk-based storage?

No. The RVA reports on tape library activities, and reports on critical information relating to tape media, drives and library elements.

12. With the increased requirements in tape storage longevity and the fact that RVA is an appliance which extends that longevity, how exactly is that accomplished?

Since the RVA gives the user historical media performance, measuring multiple points across the media and per media usage, it provides a vehicle to determine proactively how the media is degrading over its use and over its life. When degradation is detected, the user can proactively copy the data to new media and therefore avoid the situation in which the media degrades beyond recoverability. In this manner the requirement for long-term storage can be met – the data is not necessarily stored on the same piece of media over the data's effective life, but the data itself is assured regardless of the physical medium.

13. Which tape libraries and drives does your solution integrate with?

The RVA solution has been architected to support the most popular libraries and tape drives found in mid-range and enterprise-class installations. Libraries from IBM, Oracle, HP, Quantum, Overland Storage and SpectraLogic are supported, as well as LTO, TS11x0, T10K, and 9x40 tape drives. For a complete list of tested devices, please see the Crossroads Device Matrix.

14. My tape library is connected to a Fibre Channel (FC) SAN. Can RVA monitor this environment?

RVA supports FC tape libraries and FC tape drives. RVA monitors these devices by attaching to another FC port on the SAN switch. The RVA must be zoned into the same FC zone(s) as the devices it monitors.

15. Does RVA support any other connections besides Fibre Channel?

RVA will also support Oracle libraries controlled via ACSLS Manager over IP, as well as the IBM TS3494 over IP. The tape drives for these libraries, however, must be connected to the same Fibre Channel SAN as the RVA.

16. Which RVA product is right for me?

The RV50f is ideal for monitoring small libraries with no more than 90 tapes. Mid-sized to enterprise-class libraries can be monitored with the RV300f (1U appliance) or RV300vm (software RVA running as a virtual machine) Both the RV300f and RV300vm start at 100 tape slots and can be expanded to up to 100,000 slots.

17. I am currently using virtualization software to maximize the use of my servers. Will RVA work with any virtualization software?

The RV300vm is only supported on VMware ESXi version 4.1.

18. Are there any other requirements for the RV300vm?

The virtual RVA has the following system requirements:

- VMware ESXi version 4.1
- VMware vSphere Client
- Host server must support VMware VMDirectPath (Intel 5520/Tylersburg Chipset or equivalent)
- 4 GB of RAM
- 250 GB local hard drive space

- ATTO Celerity FC-42ES Fibre Channel Host Bus Adapter
- 2 Ethernet NICs

19. Will RVA work with Fibre Channel host bus adapter cards from manufacturers other than ATTO?

Crossroads has written software specifically for the ATTO FC-42ES that handles Fibre Channel communications and functionality beyond most manufacturer-provided drivers. For this reason, the ATTO card is the only Fibre Channel host bus adapter that is supported.

Crossroads has the ATTO Celerity FC-42ES available for purchase to customers purchasing the RV300vm.

20. Must I provision all the required memory for RV300vm at initial installation, or can I use thin provisioning?

Crossroads recommends that all the necessary memory be allocated at initial installation.

21. Does the RV300vm support the ArchiveVerify (AV) option? Do all RVA models support AV?

ArchiveVerify is supported on all models of RVA.

22. I have heard about ArchiveVerify (AV). How does it work?

AV allows a storage administrator to select a set, or pool, of tapes and assign one or more policies that will trigger a tape verification. When a policy is met on a tape, AV will load that tape into a drive and conduct a verification along the entire length of the written media. Specifically, AV will read each block of data on the tape, calculate its check sum, then compare this check sum with the one that was written on the tape at the time of the original data transfer. If the check sums match, the verification is considered "Good" and the next block is read. If the check sums do not match, AV will make several attempts before declaring the tape "Unreadable".

23. I have tapes that have failed verification. Is my data unrecoverable?

Crossroads recommends trying a failed tape in multiple tape drives, especially the drive used to originally write the data. There may be a drive that can successfully read the data from the media. At this point, Crossroads recommends that the data be written to a new tape cartridge, and that the original cartridge be retired.

24. Some of my tapes are encrypted. Can they be verified?

AV does not use the original application to verify the readability of the data. Since it is simply reading the raw data off the tape, the verification process works on encrypted as well as unencrypted tapes.

25. Does AV require its own dedicated drives? How do I keep AV from locking out my storage applications?

Verifications run on a user-specified schedule, on drives that the user has allocated for AV use. If, for example, a storage environment uses several tape drives for incremental, nightly backups during the week and then full backups on the weekend, AV would be able to share these drives by setting up a schedule where verifications run during week days, when the backup drives wouldn't be used. If these backup drives are needed for a data restore during the verification window, AV can easily have its operation suspended. If storage applications operate full time, or if verifications are planned to run full time, then one or more drives would need to be dedicated to the AV process.

26. What if my application needs a tape or drive while it is being verified?

AV reserves the tape drive during verification, so another application cannot accidentally alter the tape during the verification process. If the tape media or drives are needed during the verification window, AV can easily be suspended from the web-based user interface.

27. I have tapes that failed verification. Should I just retire them?

Crossroads recommends you attempt to recover the data by loading the media into several different tape drives. Once the data has been recovered, we recommend rewriting the data to a new tape and retiring the degrading cartridge.

28. Does AV check the condition of the entire length of the tape?

AV checks the tape throughout the entire length of written data.

29. What conditions can be used to trigger a verification?

AV supports several different policies that will start verifications during the AV window, if the tapes are available and in the library. Tapes are placed into tape pools, and the policies are then applied to the pools. These policies include:

- Verify tapes in this pool that have never been verified
- Verify tapes in this pool that have not been verified in X days
- Verify tapes in this pool that have not been accessed in X days
- Verify tapes in this pool that have reentered the library X times
- Verify tapes in this pool that have experienced a hard error
- Verify tapes in this pool that have experienced X soft errors
- Verify this tape now

30. How can I use AV information for my regulatory compliance audits?

AV generates a daily report of all the tapes that have been verified, and the result of that verification (Healthy, Bad Block Found, Unable to Mount, etc.). These reports provide an audit trail that demonstrates that the data on the tapes has been tested and verified as readable.

31. Who at Crossroads, should I contact if I need more detailed, technical information on this solution?

Please contact your sales representative at 1-866-BUY-CRDS (1-866-289-2737)

32. If I am interested in purchasing this solution, who should I contact?

Please contact your sales representative at 1-866-BUY-CRDS (1-866-289-2737)

33. Where can I review more information about RVA on your website?

<http://www.crossroads.com/Products/RVA.asp>



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ABOUT CROSSROADS

Crossroads Systems, Inc. (NASDAQ: CRDS), is a global provider of solutions and services that ensure stored data is proactively protected and reliably recovered. Crossroads offers organizations powerful data protection, proactive data security, intelligent storage connectivity, unmatched performance, and significant cost savings. Founded in 1996 and headquartered in Austin, Texas, Crossroads holds more than 100 patents granted and pending and has been honored with numerous industry awards for innovation in data protection and storage. Visit www.crossroads.com.

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